some have been similarly studied(*2*). Loss or deficiency of the enzyme hypoxanthine-guanine phosphoribosyl transferase (HG–PRT) imparts resistance to purine analogues. Since the gene for this enzyme is located on the X-chromosome, the use of male cells permits detection of changes in the single gene. Also, somatic cell genetic systems utilizing isoenzymes *via* their electrophoretic patterns, offer an excellent definitive tool. Changes in these isoenzyme patterns can be proof of mutation in the cultured cells. Besides confirming the relation of chromosome breakage to mutation, these somatic cell genetic systems should provide an excellent methodology for mutagenicity testing in their own right, as they are further developed.

The importance of demonstrating whether or not breakage is an indicator for mutations lies in the areas of carcinogenesis, germline mutation with increasing genetic load of the population, and perhaps in some aspects of aging.

Concerning methodology itself, preparations can be made very rapidly from tissue cultures for *in vitro* preparations that have the advantage of short time of experiments; such preparations additionally are usually morphologically better than *in vivo* preparations. Readily available cultures from *Potorous*, designated PTK–1, are exceedingly well suited for cytogenetic studies in that chromosomes are large, distinct, and there are only 11 in number. The Chinese hamster, with 22 chromosomes, has many of the same advantages, and of course there are both human leukocyte cultures and diploid human fibroblast cultures that have the advantage of being from the human species. The leukocyte cultures have the additional advantage that cell cycle is not initiated until phytohemagglutinin is added, so that timing for adding various agents for various portions of the cell cycle can be done with greater precision than in many culture systems.

The *in vivo* assays offer many of the same advantages of the host-mediated assay utilizing bacteria. That is, breakdown products and other metabolic products of the test agent have a chance to produce effects as well as the agent itself. Bone marrow, spleen, and testes are especially suitable for *in vivo* preparations, as well as embryo homogenates and tissues.

From all of these materials, both metaphase and anaphase preparations can be made. Metaphase has the advantage of excellent morphologic detail of each chromosome so that localization to specific chromosomal areas can be accomplished. Anaphase has the advantage that the pretreatment is much reduced, and the rapidity with which anaphase preparations can be read is much greater, and the experience necessary to become competent in anaphase evaluation is considerably less than for a similar degree of competence with metaphase.